

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (currently amended): A radiation image read-out method, comprising the steps of:
 - i) linearly irradiating stimulating rays through a ~~single~~-cylindrical lens onto an area of a stimulable phosphor sheet, on which a radiation image has been stored, with stimulating ray irradiating means, the stimulating rays causing the stimulable phosphor sheet to emit light in proportion to an amount of energy stored thereon during its exposure to radiation,
 - ii) receiving light, which is emitted by the stimulable phosphor sheet, with a line sensor comprising a plurality of photoelectric conversion devices arrayed along the linear area of the stimulable phosphor sheet exposed to the linear stimulating rays, the received light being subjected to photoelectric conversion performed by the line sensor, and
 - iii) moving the stimulable phosphor sheet with respect to the stimulating ray irradiating means and the line sensor and in a direction intersecting with a length direction of the linear area of the stimulable phosphor sheet exposed to the linear stimulating rays,
wherein the stimulating ray irradiating means comprises:
a plurality of laser diodes located such that laser beams, which have been produced by the laser diodes and act as the stimulating rays, stand in a row along the length direction of the linear area of the stimulable phosphor sheet exposed to the linear stimulating rays, each of the laser diodes being located in an orientation such that a beam spread direction, which is normal to a junction plane, approximately coincides with the direction, along which the laser beams stand in a row, and

AMENDMENT UNDER 37 C.F.R. § 1.114(c)
U.S. Appln. No. 09/939,659

the single cylindrical lens operable to converge each of the laser beams, which have been produced by the laser diodes, only in a plane normal to the direction, along which the laser beams stand in a row, and onto the stimulable phosphor sheet.

2. (currently amended): A radiation image read-out method, comprising the steps of:

i) linearly irradiating stimulating rays through a single cylindrical lens onto an area of a stimulable phosphor sheet, on which a radiation image has been stored, with stimulating ray irradiating means, the stimulating rays causing the stimulable phosphor sheet to emit light in proportion to an amount of energy stored thereon during its exposure to radiation,

ii) receiving light, which is emitted by the stimulable phosphor sheet, with a line sensor comprising a plurality of photoelectric conversion devices arrayed along the linear area of the stimulable phosphor sheet exposed to the linear stimulating rays, the received light being subjected to photoelectric conversion performed by the line sensor, and

iii) moving the stimulable phosphor sheet with respect to the stimulating ray irradiating means and the line sensor and in a direction intersecting with a length direction of the linear area of the stimulable phosphor sheet exposed to the linear stimulating rays,

wherein the stimulating ray irradiating means comprises:

a plurality of laser diodes located such that laser beams, which have been produced by the laser diodes and act as the stimulating rays, stand in a row along the length direction of the linear area of the stimulable phosphor sheet exposed to the linear stimulating rays,

AMENDMENT UNDER 37 C.F.R. § 1.114(c)
U.S. Appln. No. 09/939,659

the single cylindrical lens for converging each of the laser beams, which have been produced by the laser diodes, only in a plane normal to the direction, along which the laser beams stand in a row, and onto the stimulable phosphor sheet, and

optical devices, each of which is located between one of the laser diodes and the cylindrical lens and scatters the laser beam having been produced by the corresponding laser diode; wherein each of the laser diodes are located in an orientation such that a beam spread direction, which is normal to a junction plane, approximately coincides with the direction, along which the laser beams stand in a row.

3. (currently amended): A radiation image read-out method, comprising the steps of:

i) linearly irradiating stimulating rays through a single cylindrical lens onto an area of a stimulable phosphor sheet, on which a radiation image has been stored, with stimulating ray irradiating means, the stimulating rays causing the stimulable phosphor sheet to emit light in proportion to an amount of energy stored thereon during its exposure to radiation,

ii) receiving light, which is emitted by the stimulable phosphor sheet, with a line sensor comprising a plurality of photoelectric conversion devices arrayed along the linear area of the stimulable phosphor sheet exposed to the linear stimulating rays, the received light being subjected to photoelectric conversion performed by the line sensor, and

iii) moving the stimulable phosphor sheet with respect to the stimulating ray irradiating means and the line sensor and in a direction intersecting with a length direction of the linear area of the stimulable phosphor sheet exposed to the linear stimulating rays,

AMENDMENT UNDER 37 C.F.R. § 1.114(c)
U.S. Appln. No. 09/939,659

wherein the stimulating ray irradiating means comprises:

a plurality of laser diodes located such that laser beams, which have been produced by the laser diodes and act as the stimulating rays, stand in a row along the length direction of the linear area of the stimulable phosphor sheet exposed to the linear stimulating rays, each of the laser diodes being located in an orientation such that a beam spread direction, which is normal to a junction plane, approximately coincides with the direction, along which the laser beams stand in a row,

the single cylindrical lens for converging each of the laser beams, which have been produced by the laser diodes, only in a plane normal to the direction, along which the laser beams stand in a row, and onto the stimulable phosphor sheet, and

optical devices, each of which is located between one of the laser diodes and the cylindrical lens and scatters the laser beam having been produced by the corresponding laser diode.

4. (original): A method as defined in claim 1, 2, or 3 wherein the plurality of the laser diodes are located such that the laser beams, which have been produced by the laser diodes adjacent to each other among the plurality of the laser diodes, stand in a row so as to have an overlapping region, at which the laser beams overlap each other.

5. (currently amended): A radiation image read-out apparatus, comprising:

AMENDMENT UNDER 37 C.F.R. § 1.114(c)
U.S. Appln. No. 09/939,659

i) stimulating ray irradiating means for linearly irradiating stimulating rays through a single cylindrical lens onto an area of a stimulable phosphor sheet, on which a radiation image has been stored, the stimulating rays causing the stimulable phosphor sheet to emit light in proportion to an amount of energy stored thereon during its exposure to radiation,

ii) a line sensor, which comprises a plurality of photoelectric conversion devices arrayed along the linear area of the stimulable phosphor sheet exposed to the linear stimulating rays, and

iii) sub-scanning means for moving the stimulable phosphor sheet with respect to the stimulating ray irradiating means and the line sensor and in a direction intersecting with a length direction of the linear area of the stimulable phosphor sheet exposed to the linear stimulating rays,

wherein the stimulating ray irradiating means comprises:

a plurality of laser diodes located such that laser beams, which have been produced by the laser diodes and act as the stimulating rays, stand in a row along the length direction of the linear area of the stimulable phosphor sheet exposed to the linear stimulating rays, each of the laser diodes being located in an orientation such that a beam spread direction, which is normal to a junction plane, approximately coincides with the direction, along which the laser beams stand in a row, and

the cylindrical lens for converging each of the laser beams, which have been produced by the laser diodes, only in a plane normal to the direction, along which the laser beams stand in a row, and onto the stimulable phosphor sheet.

AMENDMENT UNDER 37 C.F.R. § 1.114(c)
U.S. Appln. No. 09/939,659

6. (currently amended): A radiation image read-out apparatus, comprising:

i) stimulating ray irradiating means for linearly irradiating stimulating rays through a single cylindrical lens onto an area of a stimulable phosphor sheet, on which a radiation image has been stored, the stimulating rays causing the stimulable phosphor sheet to emit light in proportion to an amount of energy stored thereon during its exposure to radiation,

ii) a line sensor, which comprises a plurality of photoelectric conversion devices arrayed along the linear area of the stimulable phosphor sheet exposed to the linear stimulating rays, and

iii) sub-scanning means for moving the stimulable phosphor sheet with respect to the stimulating ray irradiating means and the line sensor and in a direction intersecting with a length direction of the linear area of the stimulable phosphor sheet exposed to the linear stimulating rays,

wherein the stimulating ray irradiating means comprises:

a plurality of laser diodes located such that laser beams, which have been produced by the laser diodes and act as the stimulating rays, stand in a row along the length direction of the linear area of the stimulable phosphor sheet exposed to the linear stimulating rays,

the single cylindrical lens for converging each of the laser beams, which have been produced by the laser diodes, only in a plane normal to the direction, along which the laser beams stand in a row, and onto the stimulable phosphor sheet, and

optical devices, each of which is located between one of the laser diodes and the cylindrical lens and scatters the laser beam having been produced by the corresponding laser diode; wherein each of the laser diodes are located in an orientation such that a beam spread

AMENDMENT UNDER 37 C.F.R. § 1.114(c)
U.S. Appln. No. 09/939,659

direction, which is normal to a junction plane, approximately coincides with the direction, along which the laser beams stand in a row.

7. (currently amended): A radiation image read-out apparatus, comprising:

- i) stimulating ray irradiating means for linearly irradiating stimulating rays through a single cylindrical lens onto an area of a stimulable phosphor sheet, on which a radiation image has been stored, the stimulating rays causing the stimulable phosphor sheet to emit light in proportion to an amount of energy stored thereon during its exposure to radiation,
- ii) a line sensor, which comprises a plurality of photoelectric conversion devices arrayed along the linear area of the stimulable phosphor sheet exposed to the linear stimulating rays, and
- iii) sub-scanning means for moving the stimulable phosphor sheet with respect to the stimulating ray irradiating means and the line sensor and in a direction intersecting with a length direction of the linear area of the stimulable phosphor sheet exposed to the linear stimulating rays,

wherein the stimulating ray irradiating means comprises:

a plurality of laser diodes located such that laser beams, which have been produced by the laser diodes and act as the stimulating rays, stand in a row along the length direction of the linear area of the stimulable phosphor sheet exposed to the linear stimulating rays, each of the laser diodes being located in an orientation such that a beam spread direction, which is normal to a junction plane, approximately coincides with the direction, along which the laser beams stand in a row,

AMENDMENT UNDER 37 C.F.R. § 1.114(c)
U.S. Appln. No. 09/939,659

the single cylindrical lens for converging each of the laser beams, which have been produced by the laser diodes, only in a plane normal to the direction, along which the laser beams stand in a row, and onto the stimulable phosphor sheet, and

optical devices, each of which is located between one of the laser diodes and the cylindrical lens and scatters the laser beam having been produced by the corresponding laser diode.

8. (original): An apparatus as defined in claim 5, 6, or 7 wherein the plurality of the laser diodes are located such that the laser beams, which have been produced by the laser diodes adjacent to each other among the plurality of the laser diodes, stand in a row so as to have an overlapping region, at which the laser beams overlap each other.

9. (currently amended): A radiation image read-out method, comprising the steps of:

i) linearly irradiating stimulating rays through a single cylindrical lens onto an area of a stimulable phosphor sheet, on which a radiation image has been stored, with stimulating ray irradiating means, the stimulating rays causing the stimulable phosphor sheet to emit light in proportion to an amount of energy stored thereon during its exposure to radiation,

ii) receiving light, which is emitted by the stimulable phosphor sheet, with a line sensor comprising a plurality of photoelectric conversion devices arrayed along the linear area of the stimulable phosphor sheet exposed to the linear stimulating rays, the received light being subjected to photoelectric conversion performed by the line sensor, and

AMENDMENT UNDER 37 C.F.R. § 1.114(c)
U.S. Appln. No. 09/939,659

iii) moving the stimulable phosphor sheet with respect to the stimulating ray irradiating means and the line sensor and in a direction intersecting with a length direction of the linear area of the stimulable phosphor sheet exposed to the linear stimulating rays,

wherein the stimulating ray irradiating means comprises:

a laser diode, which produces a laser beam acting as the stimulating rays, and
the single cylindrical lens, which converges the laser beam with respect to one direction in order to form a linear laser beam, and which has a curvature varying over a lens longitudinal direction, such that a beam diameter of the linear laser beam at the linear area of the stimulable phosphor sheet exposed to the linear stimulating rays becomes uniform, wherein the laser beam is converged only in a plane parallel to a junction plane of the laser diode.

10. (original): A method as defined in claim 9 wherein a plurality of laser diodes are located such that the laser beams, which have been produced by the laser diodes and act as the stimulating rays, stand in a row along a length direction of the linear area of the stimulable phosphor sheet exposed to the linear stimulating rays.

11. (original): A method as defined in claim 10 wherein the plurality of the laser diodes are located such that the laser beams, which have been produced by the laser diodes adjacent to each other among the plurality of the laser diodes, stand in a row so as to have an overlapping region, at which the laser beams overlap each other.

AMENDMENT UNDER 37 C.F.R. § 1.114(c)
U.S. Appln. No. 09/939,659

12. (currently amended): A radiation image read-out apparatus, comprising:

i) stimulating ray irradiating means for linearly irradiating stimulating rays through a single cylindrical lens onto an area of a stimulable phosphor sheet, on which a radiation image has been stored, the stimulating rays causing the stimulable phosphor sheet to emit light in proportion to an amount of energy stored thereon during its exposure to radiation,

ii) a line sensor, which comprises a plurality of photoelectric conversion devices arrayed along the linear area of the stimulable phosphor sheet exposed to the linear stimulating rays, and

iii) sub-scanning means for moving the stimulable phosphor sheet with respect to the stimulating ray irradiating means and the line sensor and in a direction intersecting with a length direction of the linear area of the stimulable phosphor sheet exposed to the linear stimulating rays,

wherein the stimulating ray irradiating means comprises:

a laser diode, which produces a laser beam acting as the stimulating rays, and
the single cylindrical lens, which converges the laser beam with respect to one direction in order to form a linear laser beam, and which has a curvature varying over a lens longitudinal direction, such that a beam diameter of the linear laser beam at the linear area of the stimulable phosphor sheet exposed to the linear stimulating rays becomes uniform, wherein the laser beam is converged only in a plane parallel to a junction plane of the laser diode.

13. (original): An apparatus as defined in claim 12 wherein a plurality of laser diodes are located such that the laser beams, which have been produced by the laser diodes and act as the

AMENDMENT UNDER 37 C.F.R. § 1.114(c)
U.S. Appln. No. 09/939,659

stimulating rays, stand in a row along a length direction of the linear area of the stimulable phosphor sheet exposed to the linear stimulating rays.

14. (original): An apparatus as defined in claim 13 wherein the plurality of the laser diodes are located such that the laser beams, which have been produced by the laser diodes adjacent to each other among the plurality of the laser diodes, stand in a row so as to have an overlapping region, at which the laser beams overlap each other.

15. (new): The radiation image read-out method as claimed in any one of claims 1-3, wherein the cylindrical lens comprises a single continuous cylindrical surface.

16. (new): The radiation image read-out apparatus as claimed in any one of claims 5-7, wherein the cylindrical lens comprises a single continuous cylindrical surface.

17. (new): The radiation image read-out method as claimed in any one of claims 9-11, wherein the cylindrical lens comprises a single continuous cylindrical surface.

18. (new): The radiation image read-out apparatus as claimed in any one of claims 12-14, wherein the cylindrical lens comprises a single continuous cylindrical surface.